The Tongan Maritime Expansion: A Case in the Evolutionary Ecology of Social Complexity

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PACIFIC ISLAND SCHOLARS have long pondered the origin of Polynesian "complex chiefdoms" and their political expansion throughout remote Oceania (e.g., Goldman 1955, 1970; Goodenough 1957; Sahlins 1958, 1963; Williamson 1924). Among archaeologists, social stratification, the increasing authority of elites, and territorial integration in Polynesia (and especially Hawai'i) have been variously explained as resulting from population growth, agricultural intensification, and the control over material and ideological domains by leaders in ecologically sensitive island environments—conditions that may give rise to competition and conflict through expansionist warfare and the geographical extension of polities (e.g., Cordy 1981; Earle 1991; Hommon 1976; Kirch 1984, 1988*a*, 1990*a*; Kirch and Green 1987; Kolb 1991, 1994; Suggs 1961; Tuggle 1979). These views parallel, in part, the work of Carneiro (1970, 1972), Flannery (1972), and Harris (1979), who argue that phenomena such as warfare and agricultural intensification are cultural mechanisms designed to counter social instabilities caused by population pressure, limited resources, and ecological degradation and which at the same time promote social complexity. Particularly for Pacific Island archaeologists, changes in insular ecology extrapolated from the paleoenvironmental and archaeological records present ideal "laboratory conditions" to explain agricultural intensification, demographic changes, and subsequent social stratification and conflict (e.g., Clark and Terrell 1978; Kirch 1984, 1997). Developed within the framework of a generalizing science of cultural evolution, this remains the dominant mode of interpretation employed by much of the Americanist archaeological community in the Pacific.

A number of researchers, however, have acknowledged that while ecological settings and their influence on humans are significant conditions to explain the *proximate causes* leading to political stratification and territorial integration (i.e., through conflict or cooperation), they alone (or even as more abstract generalizations) cannot provide an explanation for the *ultimate causes* leading to the emergence and persistence of complex societies (e.g., Cachola-Abad 1998; Graves and

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Sweeney 1993; Graves and Ladefoged 1995; Ladefoged 1993*a*, 1995). In our view, explanations for the development of complex chiefdoms in Polynesia can be explained best by a Darwinian model that focuses on the aggregate results of individual competitive and cooperative behavioral strategies (rather than those of populations) that provide them with selective advantages over other members within or across social groups. The inclusion of a Darwinian approach to extant ecological and social explanations of social complexity has the potential for incorporating those proximate variables within a comprehensive theoretical structure and thereby enlarging the explanatory breadth of archaeological and ethnohistorical research in the region.

This paper employs theoretical tenets from evolutionary ecology to develop a model for social complexity and then analyzes by means of that model the prehistoric and historic evolution of Tongan social complexity and its relationship to maritime expansion in western Polynesia. The Tongan case provides a good archaeological and ethnohistorical example for several reasons. First, various aspects of it have been examined by a number of researchers (Bott 1981; Burley 1994; Davidson 1979; Gifford 1924, 1929; Goldman 1970; Green 1973; Kaeppler 1971, 1978; Kirch 1980, 1984, 1988*b*, 1990*b*; McKern 1929; Sahlins 1958) but as yet there has been no comprehensive explanation for the nature of Tongan social complexity, maritime expansion in west Polynesia, and the relationship of these to environmental structure.[1] Here, we use the Tongan case to show how the competitive and cooperative behavioral strategies of individuals in an environmentally unpredictable and increasingly circumscribed agricultural landscape resulted in social stratification, political integration, far-flung exchange relationships, and expansionist colonization and warfare. These phenomenon can be explained by two interrelated processes: intragroup and intergroup competition (Durham 1976; Boone 1983, 1992). Intragroup competition results from different competitive strategies among members of the same social unit. Intergroup competition, on the other hand, occurs when particular groups employ defensive or offensive strategies to deal with resource-limited and/or unpredictable environments. These two strategies do not occur in isolation, as ruling elites may simultaneously secure critical resources and attempt to redirect intragroup aggression away from themselves toward other groups (Boone 1983). This is a Darwinian approach because the fitness of individuals, through either reproduction or replication of their characteristics, will be enhanced relative to their success at employing behavioral strategies that improve resource access and control and limit their risk of injury or elimination.

The Tongan case can be matched against the evolutionary theoretical expectations for at least three significant reasons. First, at the time of European contact most if not all of the arable land in the Tongan archipelago was under intense dry land cultivation, a situation that generated an environment of escalating competition among chiefly lines for the control of productive land (Green 1973). Second, ethnohistorical,[2] archaeological, and ethnographic accounts of Tongan social stratification support the models of competition and group aggression outlined in this paper. Finally, prior to the twentieth century, the transport of individuals and establishment of Tongan colonies throughout the Tongan archipelago, Fiji, Samoa, and other islands of the central Pacific indicate an outward movement of Tongan populations—a phenomenon that, as suggested from

oral traditions, historical records, linguistic, and archaeological evidence, took place gradually over a period of approximately 700 years, from the twelfth to the nineteenth centuries (Bott 1982; Gifford 1929).

THE THEORY OF EVOLUTIONARY ECOLOGY

The call by Robert Dunnell (1980) for a paradigmatic shift in archaeology from cultural evolution to an evolutionary framework consistent with the principles, mechanisms, and ontology of Darwinian evolution has precipitated a growing number of archaeologists working in the Pacific to develop and apply such a perspective to their research and analyses (e.g., Allen 1996; Cachola-Abad 1998; Cochrane 1998; Field 1988; Hunt 1987, 1989; Graves and Cachola-Abad 1998; Graves and Sweeney 1993; Graves and Ladefoged 1995; Ladefoged 1993*a*, 1995; Moniz-Nakamura 1998). Broadly defined, cultural evolution as applied to Oceanic studies of social complexity explains the origins of complex chiefdoms and variability between these "state-like" societies as resulting from the particular ecological and cultural settings in which they develop. The emphasis is on demonstrating the "macro" transformations of societies, usually typologically described at the scale of entire archipelagos. While important insights have been realized by this approach, cultural evolution has been less successful in systematically identifying and evaluating mechanisms to explain how varying human behavior differentially results in the formation of complex societies. Additionally, much cultural evolution in Oceania is premised on the assumption that increases in social complexity are made possible by greater quantities of environmentally based productivity (see Graves and Ladefoged 1995; Graves and Sweeney 1993).

Darwinian evolution's explanatory focus transcends the empirical generalizations of cultural evolution in historical studies by developing, in part, a set of causal explanations based on mechanisms of natural selection to show why certain classes of traits (behavioral or material) have evolved. Briefly, individuals exhibit phenotypic variation in their behavior and artifacts that affects their capacity to survive and/or to replicate their phenotypic features. Within a population, some (not all) traits are adaptive in the environment in which they occur and those that are will predominate (i.e., be favored by natural selection) among those individuals who over time present these features. As such, these traits will become more prevalent in subsequent generations. Human evolutionary ecology, a field of anthropology that employs Darwinian evolutionary principles, examines the phenotype of an organism (i.e., biological and behavioral traits) and explains why a particular phenotypic trait, such as aggression, evolves in a specific environmental context (Smith and Winterhalder 1992). Because evolutionary theory assumes selection occurs at the level of the individual, evolutionary ecology focuses on individuals as the units of evolutionary transmission and change. This view departs from that of most social science, which has generally viewed social institutions as the superorganic units of study and treats them as goal-oriented entities that may override the actions and intentions of their constituent members. From the standpoint of evolutionary ecology, individual actors are the ultimate components of social groups and, therefore, the fundamental explanatory units of human behavior (Smith 1987).

With this in mind, the model presented in this paper assumes that the configu-

ration of social groups results from the cooperative and competitive strategies of individuals attempting to gain access to and control of limited resources within particular environmental settings. However, because social cohesion is by definition an interdependent relation, the behavioral strategies of individuals are shaped by the actions taken by other members of their social group and other social groups with which they may interact. In addition, individuals must in some fashion measure (or be measured against) the costs incurred with group affiliation, where they will be potentially confronted with increased competition, additional effort or labor, and potential exposure to pathogens, against the possible benefits of resource and mate accessibility, protection from other competitors, enhancement of others, and the opportunity to serve as replicators of behavioral traits for a group. The costs and benefits of affiliating with any given group are also evaluated within the context of the possible costs and benefits of leaving a group and facing a less predictable environment (Boone 1992; Hawkes 1992). So long as the benefits to individuals of group affiliation outweigh the costs, individuals should remain in groups with successful strategies. James Boone (1992:301) has raised the fundamental question of social complexity: If it is the case that groups form and persist because of individual mutual self-interests, why then does social difference, unequal access to resources, and exploitation of others arise? And why it is accepted by members of the group?

Hawkes (1992), among others, has argued that social inequality develops when there is great competition for resources and environmental circumscription restricts the options available to individuals. Many members of a group resort to "social parasitism" by providing for the fitness of others to ensure their own survival. Thus "mutualism," or reciprocal assistance, develops when individuals benefit, in one measure or another (e.g., risk minimization or rate maximization), from sharing with others even though the benefits of this sharing may be unequally distributed (see Winterhalder 1990). Because individuals hold a wide array of self-interests, the costs and benefits of reciprocity do not fall equally among all members of a group. Mutual cooperation turns into "manipulation" when some members receive a greater per capita share while carrying a lower burden (Hawkes 1992:275). For those disadvantaged, collective action and affiliation may still be beneficial (i.e., outweigh the costs) under conditions of low interterritorial mobility, circumscription of land, fixed technological investments, resource scarcity and/or unpredictability, and high intergroup competition. Hierarchical social relations, even under relatively oppressive circumstances, are reciprocal transactions of goods and/or services of one kind or another between dominant and subordinate individuals, and the costs and benefits of their relative resource positions may be quite different. Ruling elites will tolerate up to a certain number of subordinates (sharing resources) and thus limiting their access, while they may be more vulnerable to aggression. At the same time, subordinates will tolerate (to varying degrees) some degree of authoritarian control and resource differentials favoring those of higher rank as long as they continue to benefit from the collective action and protection of the group or if they can anticipate the possibility of elite replacement (Boone 1983, 1992). When emigration or disbanding groups are not feasible strategies, environmental circumscription instigates intragroup competition and the concomitant emergence and persistence of stratified societies (see Alexander 1974).

Environmental and geographic factors and their influence on individual competitive strategies not only set the stage for the emergence of sociopolitical stratification, but also for the simultaneous development of intergroup competition in the form of aggression and expansionist warfare. Dyson-Hudson and Smith (1978) have suggested that territoriality is expected to follow when important resources are both dense and predictable over space and time, and when the benefits of resource control (i.e., exclusion) outweigh the costs of defense. Resource distributional patterns and territorial range and size are of critical importance in determining the cost-benefit ratio of territorial behavior. In areas where fertile land is abundant and where migration remains a possible alternative, the cost of defending a territory might outweigh the benefits in excluding others from access to the resources (Cashdan 1983). As new agricultural land becomes less abundant, more distant, or of poorer quality, the benefits of territorial exclusion will begin to outweigh the cost of defending the resources and may, in fact, increase collective aggression as an adaptive strategy to enhance the success of constituent members (Cashdan 1992).

Durham (1976 : 390) proposes that aggressive behavior in a resource-limited environment should occur when inclusive fitness is enhanced by the seizure of resources from other groups, and when inclusive fitness is jeopardized by the activities of nearby competitors. Under these circumstances individuals will participate in aggression to increase their individual fitness through either individual or collective engagements. If the latter, some kind of compensation, as either goods or services, or both, has to be redistributed by the main beneficiary to maintain the inclusive fitness of all the members of the group. The greater the number of individuals who join an aggressive group, the lower the amount of resources available after successful aggressive encounters to both elites and other subordinates. At the same time, this would decrease the average costs and reduce exposure to mortality among group members. Moreover, the enlisting of more individuals can increase the competitive ability of the group, and thus the possibility for further territorial expansion or defense (Boone 1983).

The processes of intragroup and intergroup competition as defined above are by definition mutually reinforcing because as intragroup competition heightens, the process of intergroup aggression is exacerbated. One strategy for managing intragroup competition may be for elites to redirect competition away from themselves by establishing and promoting new "niches" for their offspring and/or competitors (and sometimes, for themselves) in trade and exchange, technological invention and applications, managing ceremonial or ritual organizations, undertaking voyaging and colonization, and particularly engaging in empire building. Or elites may install recruitment bars, such as primogeniture or gender rules (Colinvaux 1982 : 243). It is the former—the creation of new niches—that more effectively diverts competition. The inclusive fitness of ruling elites is best enhanced through the diversion of their closest competitors to alternative endeavors that will engage them and may, at the same time, provide marginal rates of return. These individuals, in turn, may improve their own fitness by accepting a subordinate or alternative position, and some may profit from the experiences gained through these opportunities to travel, to explore and discover new lands and resources, to trade, to colonize, to develop new roles and organizations within a society, and to engage in warfare and conquest with others.

These niches may even allow for the possibility of usurping dominant elites by their subordinates.

When applied to Tonga the model outlined above can be summarized as follows: Environmental and geographical conditions played a critical role in the development of Tongan social stratification and expansionist strategies, including voyaging, trade, and warfare. A landscape that made dry land cultivation feasible in a region of fertile but limited arable land led to a relatively intensified form of permanent field agriculture, a growing population, and the development of intra- and intergroup competition among members of the main Tongan polity on the island of Tongatapu. Intergroup competition resulted in early localized political integration (i.e., integration of formerly independent factions within Tongatapu), differentiation by social rank, and was followed by the development of dual paramountcy. Intragroup competition led to expansion of the Tongan interaction with nearby islands, the development of voyaging technology and lore, increased interisland mobility, colonization and/or integration by Tongan elites of these and more distant islands, the geographic expansion of staple and wealth finance, and the movement of spouses through long-distance exchanges.

Tongan ruling elites encouraged younger collaterals to wage warfare on other islands and thus redirected their rivalry away from themselves and against other groups, while at the same time furthering territorial expansion through the incorporation (at varying levels) of independent chiefdoms. Our study shall show both historically and through archaeological evidence how and when ruling elites in Tonga were able to consolidate their power internally and redirect potential rivals through three major strategies: (1) by establishing new aristocratic titles, (2) by encouraging younger siblings or individuals from junior lines to engage in expansionist warfare, and (3) by controlling the development and use of voyaging technology and lore so as to effectively transport staple goods and to monopolize their position for the transport of wealth finance and the institutionalized exchange of high-ranking spouses.

To extend the hegemonic control of the elites on Tongatapu over near and distant islands, Tongans took advantage of technological means to move large numbers of men and resources. Voyaging canoes and their navigators were key elements in both Tongan expansionist warfare and trade monopolies. In addition to their importance as a military and transport technology, these canoes and their successful navigation were also excludable resources, or resources that could be appropriated by a single person or group of individuals. Individuals controlling this technology and information were able to extend the dominance of their polities at the expense of those lacking the technology. Prior to examining each of the key strategies mentioned above, we briefly explore the Tongan environmental, geographic, and sociopolitical context prior to and at the time of European contact.

THE ENVIRONMENT OF TONGA AND NEARBY ARCHIPELAGOS

The Tongan group of islands stretches from south to north over an area of 300 km (excluding Niuatoputapu and Niuafo'ou), and includes about 200 islands and numerous coral islets comprising about 700 km^2 clustered into four main groups: Tongatapu, Ha'apai, Vava'u, and Niuatoputapu archipelagos (Fig. 1). Its main

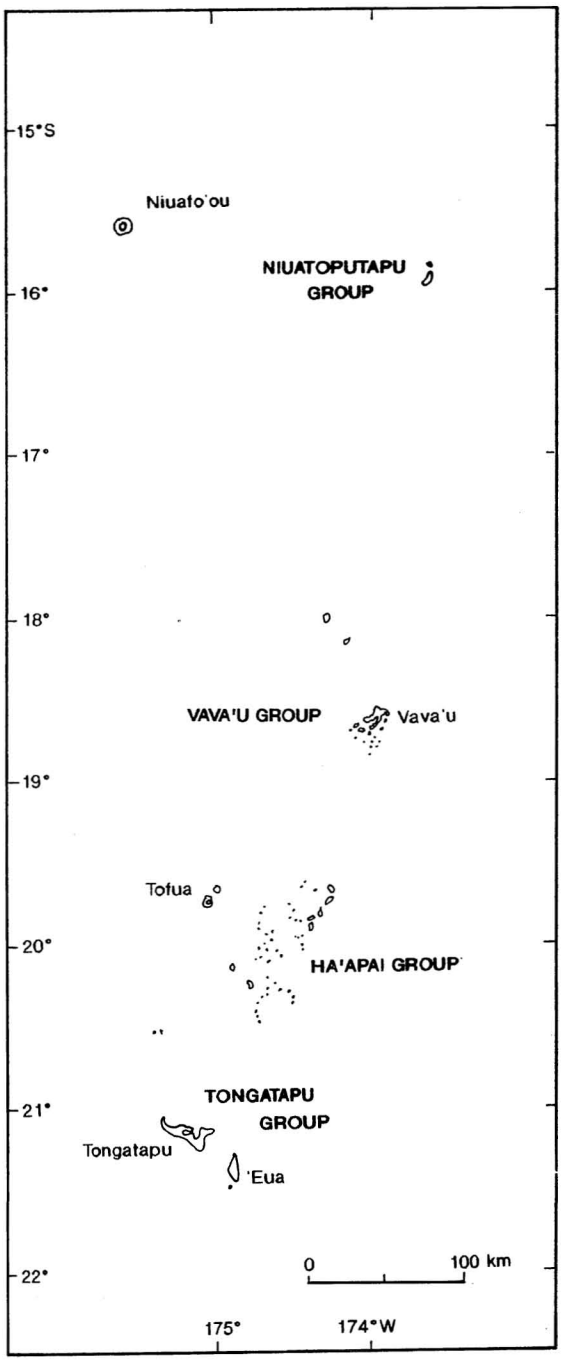

Fig. 1. Map of main Tonga islands.

island, Tongatapu, has the largest land mass (275 km^2) followed by Vava'u, 'Eua, and Tofua. With the exception of the inhabited northern outliers of Niautoputapu and Niuafo'ou, the main islands are raised limestone formations (*makatea*) with rich volcanic ash soils suitable for dry land cultivation (Thomas 1963). This

soil type is fertile, and about 85 percent of the area of the raised limestone islands is suitable for cultivation (Maude 1970:58). Yams were the main cultigens in Tonga, supplemented by coconut, taro, and sweet potato. Kirch (1984:221) has identified three major environmental factors influencing agricultural development in Tonga: (1) a relatively small landmass (compared to other nearby island archipelagos), (2) the absence of rivers and permanent sources of water (and hence irrigation), and (3) unpredictable climatic phenomena such as cyclones and droughts. Perhaps of greater importance was annual rainfall, which varied from about 1700 mm in Tongatapu to nearly 2200 mm in Vava'u to the north, with considerable month-to-month and year-to-year variation. The dry season extends from approximately May through October, when less than 40% of the rainfall occurs, and droughts occur periodically (Davidson 1979:86).

The discovery and colonization of Fiji and west Polynesia by voyagers associated with the Lapita complex is generally dated to at least 1000 B.C. (Irwin 1992:68–69). The large size and general proximity of the three main island groups—Fiji, Tonga, and Samoa—likely produced a nearly simultaneous archaeological date of settlement by early eastern Lapita. During the first 1000–1500 years of human occupation, this region shared a broadly similar ceramic sequence (Davidson 1977; Irwin 1992:73); afterward, island groups begin to diverge. Yet, as Irwin (1992:175, 194) shows, the archipelagos of Fiji, Tonga, Samoa, and other islands of the central Pacific (such as Niue, Rotuma, Futuna, 'Uvea, Tuvalu, and Tokelau) are much more accessible to each other because of shorter interisland distances compared to islands farther to the east in Polynesia.

The location and distribution of the Tongan Islands within this region (Fig. 2) should be noted for their roughly south-to-north extent, which facilitated interisland voyaging within the group because trade winds blow from the south, mostly during the dry season (Kirch 1984:219). Samoa lies 300 km north of the Tongan northern outliers (Davidson 1979:84), the Lau Island group in eastern Fiji is 275 km northwest of Tonga (Frost 1979:61), and the main islands of Viti Levu and Vanua Levu lie about 350 km west and north of Tongatapu (Hage and Harary 1996:117). All of the other neighboring islands with which Tonga is associated are located in a generally northern direction, including Rotuma, Futuna, 'Uvea, and Tokelau. As we shall see, the location of Tonga (relative to its closest neighbors) was well suited to the strategy of geographic expansion.

THE HISTORICAL DEVELOPMENT OF TONGA'S POPULATION, AGRICULTURE, AND SOCIETY

All of west Polynesia and Fiji have a potential human history of approximately 3000 years. The gradual occupation of the islands in this region from larger to smaller islands, from nearby to more distant islands, and from near-shore settlements to areas in the uplands or interior portions of islands occurred over a period of two millennia (Kirch 1984). Green (1973) has argued that Tonga reached its maximum population well before the arrival of Europeans. He has calculated Tongatapu's population in the eighteenth century, using land availability and food production per acre, to be between 15,000 and 17,000 (Green 1973:69–73). An estimate by Cook in 1773 during a ceremonial dance in Tongatapu was of a population of approximately 13,000. Using ethnohistorical

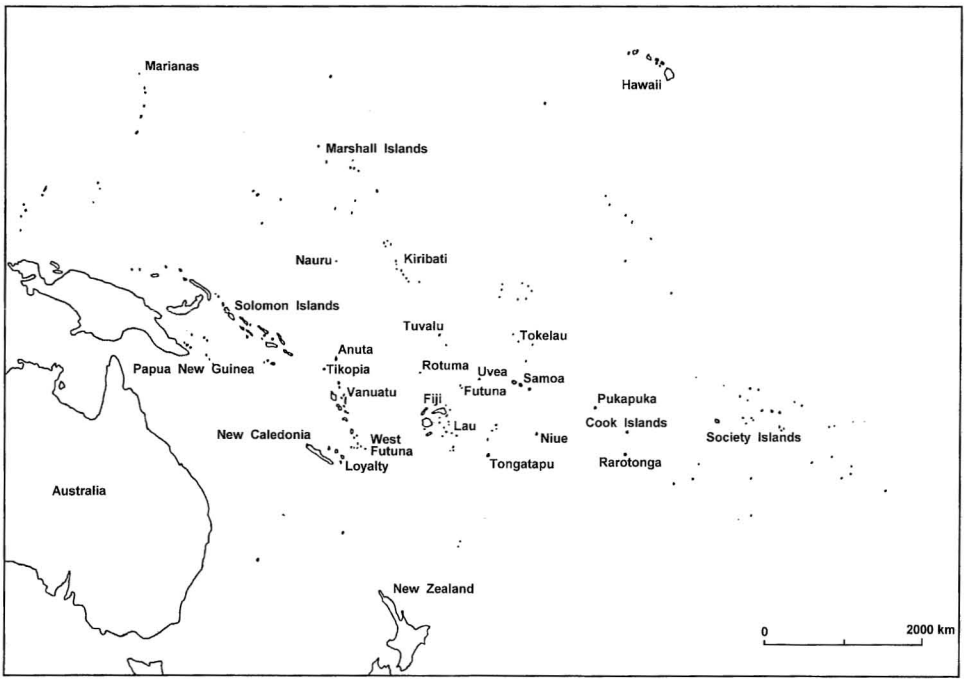

Fig. 2. Map of west central Pacific, including Tonga, Fiji, Samoa, and other islands mentioned in the text.

accounts and demographic models, Green concludes that Tongatapu could have reached a population of 17,000 as much as 1000 years before European contact—a situation resulting in the occupation of all available arable land. Kirch (1984 : 222) estimates the occupation of all productive land in Tongatapu somewhat earlier, between 300 B.C. and A.D. 700. With significantly larger land areas, more diverse topography, and smaller proportions of arable land, both Samoa and Fiji likely had a slower rate of population increase than Tonga and may have reached comparable population size and density at a later date.

The population size and density reported historically for Tonga is a reflection of the considerable agricultural development of the islands, but this intensification was dependent upon dry land farming. Rainfall variability, especially the occurrence of droughts, affects the reliability of dry land farming (see Kirch 1984 : 188–190; Ladefoged et al. 1996 for an example from Hawai'i), and this uncertainty augmented competition between existing polities within Tonga. Kirch (1984 : 223) links the archaeological appearance at about A.D. 1000 of large-scale monumental structures throughout Tonga, a form of advertising competitive ability (see Neiman 1997), to this process. Soon thereafter, on Tongatapu a single polity integrated the entire island. This integration is consistent with our efforts (see below) to seriate burial mounds from Tongatapu; there is no indication of geographical difference on Tongatapu in the occurrence of stylistic traits for these monumental features. They all represent the work of a single social unit. Political interaction between Tongatapu and Ha'apai and Vava'u groups occurred as early

as the twelfth century A.D. Between the fifteenth and seventeenth centuries A.D., competition among ruling elites resulted in the political integration of these groups as well as interarchipelago expansionist warfare. Archaeological, linguistic, and ethnohistorical evidence suggest that Tongan domination or influence extended to the Tongan outliers of Niuatoputapu and Niuafo'ou by the seventeenth to eighteenth centuries A.D. (Kirch 1984:233–234), 'Uvea at approximately the same time (Kirch 1984:234–235; Sand 1993), Rotuma in protohistoric times (Ladefoged 1993*a*), Eastern Fiji to the west in the eighteenth century (Hocart 1929), and parts of Samoa to the northeast (Kirch 1984; Mahina 1986). Tongans appear to have also influenced, in one way or another, populations on the islands of Niue and Futuna, and as oral traditions and linguistic evidence suggest, they might have had contact with the Polynesian outliers of Anuta and Tikopia in the Solomon Islands, Pukapuka in the Cook Islands, and Fakaofu in the Tokelau Group (Feinberg 1989; Firth 1961; MacGregor 1937).

Tonga had developed a highly stratified system long before Cook's arrival in the islands. A powerful chieftainship controlled by the Tu'i Tonga dynasty ruled the archipelago from the settlement established in the twelfth to thirteenth centuries A.D. at Mu'a on Tongatapu until the lineage's political weakening in the fifteenth or sixteenth century with the ascension of the Tu'i Ha'atakalaua (Kirch 1984) and the creation of a dual paramountcy. Again, during the seventeenth century a second shift of power occurred when the Tu'i Kanokupolu gained control of the Tongan polity. Tonga was ruled by a powerful aristocracy, which ostensibly maintained strong control over their territorial domains and over the subjects they ruled (Afeaki 1983; Bellwood 1978; Herda 1988). Thirty-nine generations of Tu'i Tonga formed an unbroken patrilineal succession until 1865 (Kirch 1984:223–224). Political integration at Tongatapu apparently occurred during the rule of the tenth Tu'i Tonga, who united the sacred and secular lines through intermarriage (Goldman 1970; Herda 1988). This union of the secular with the sacred occurred along with the territorial integration of existing competing polities within Tonga itself.

CREATING NEW TITLES FOR CLOSEST COMPETITORS

Ruling elites can deflect their closest competitors as new structural niches become available for them to occupy. Tongan paramount chiefs were able to avoid sustained confrontation with their closest kinsmen by establishing new noble titles (see Boone 1983:85). This took two forms: within the main ruling lineage of Tongatapu itself and by the offering of titles for those who succeeded in expeditions to establish Tongan hegemony over other islands. In the first case, this enabled the main lineage to remain intact although the scope and nature of power wielded was structurally altered. Two such events are recorded in Tongan oral history. The first began with the assassination of the nineteenth Tu'i Tonga Havea I, and the ensuing assassinations of the twenty-second and twenty-third Tu'i Tonga, Havea II and Takalaua, in the fifteenth century (Gifford 1924; Goldman 1970). After the death of Takalaua and ensuing political upheaval, his older son, Kau'ulufonua fekai, was installed as the twenty-fourth Tu'i Tonga. He rapidly reorganized the political framework by appointing close kinsmen as gov-

ernors of the Tongan possessions and changed the hierarchical structure of the central polity at Tongatapu (Bott 1982).

Kau'ulufonua fekai, in fear of future assassination attempts, dismantled the tenth Tu'i Tonga's union of the sacred with the secular. In doing so he constituted a new title, that of Tu'i Ha'atakalaua, and gave it to his younger brother Mo'ungamotu'a, thus keeping the sacred and less dangerous title for his own. The Tu'i Ha'atakalaua's duties were to look after the secular affairs of the kingdom. Most important of his duties was to see that the people paid respect to the Tu'i Tonga, and particularly that they sent *'inasi* and other tributary goods (Bott 1982). By reorganizing the political structure of the Tongan polity, Kau'ulufonua fekai accomplished two things: he was able to ensure the continuation of his own line by taking a less dangerous but nonetheless allied position, while at the same time giving his closest competitor, his brother, an important title. Tongan cheftainship was split into a "working monarch," who assumed a more populist embodiment, and the Tu'i Tonga, who remained as a sign of godly incarnation —a fact reflected in the annual tribute paid to him by commoners and lesser chiefs (Decktor-Korn 1974, 1978; Marcus 1988). The *'inasi*, which Mariner defined as "a share or portion of any thing that is to be, or has been distributed out" (Martin 1818 : 197), was an annual tribute of fruits, mats, foodstuffs, and other gifts that were offered to religious deities in the person of the Tu'i Tonga. This annual event involved the giving of thanks to the gods and the acknowledgment of their powers (Ferdon 1987; Mahina 1986; Urbanowicz 1973). Apart from its religious connotation, the *'inasi* served as a centrifuge of Tongatapu's power over the other islands by substantiating the Tu'i Tonga's claim to supreme political power (Kirch 1984 : 230).

This segmentation of the paramount lineage into two parts is reflected archaeologically in the spatial layout of the ceremonial precinct known as Lapaha (Fig. 3) in the village of Mua on Tongatapu (see McKern 1929 : 90–101; Kirch 1984 : 227–230). Here, it is recorded that the Tu'i Tonga lived beginning as early as the eleventh or twelfth century A.D. (McKern 1929 : 100). The central area of Lapaha is associated with the main dwelling of this paramount, the house of the paramount's priest, the *malae* (open ceremonial court), several large burial mounds, perhaps a second *malae* (recorded as a refuge by McKern [1929]), and a number of smaller dwellings for his retainers. An encircling fortification surrounds this central area from the west, south, and east; the northern boundary of Lapaha fronts the coastline. A number of burial mounds are located to the east of the fortification and their orientation and location suggests they were once part of Lapaha proper. A second area, immediately north of Lapaha and named Moalunga, was built and occupied by the first Tu'i Ha'atakalaua. It is situated on land that is in the direction of the coast from Lapaha but that apparently was too near to water (or was actually submerged at the time that much of Lapaha was constructed). The encircling fortification does not extend around Moalunga; it ends at the former shoreline boundary. Moalunga includes the chief's dwelling, those of his wives, the dwelling of his ranking officials, other dwellings, the chief's burial mound and those of his wives, and the great stone dock known as Mounu. The section was clearly established after the main area and fortification of Lapaha was built. Its contruction should date to after the fifteenth century.

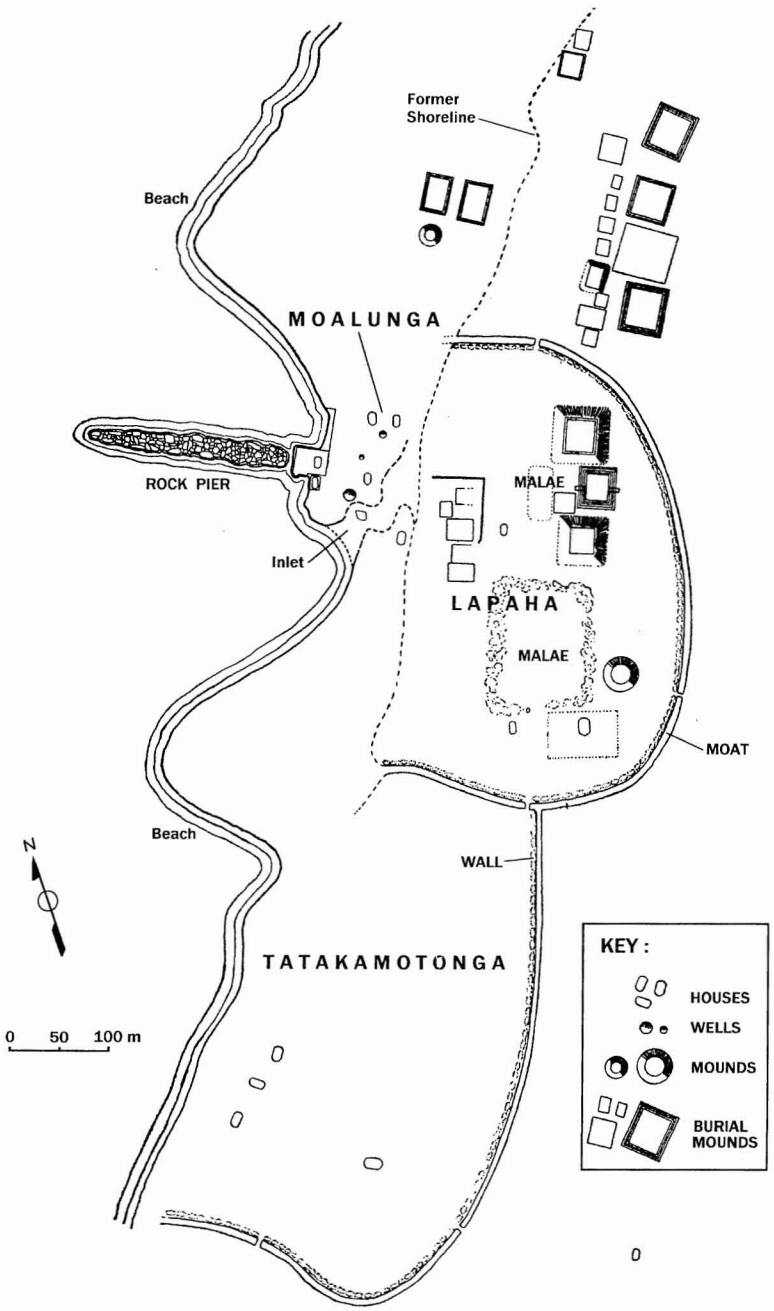

Fig. 3. Map of the ceremonial precinct of Lapaha, at Mu'a, Tongatapu (adapted from McKern 1929).

The second split in chiefly power occurred six generations after the formation of the Tu'i Ha'atakalaua. The formation of a second chiefly lineage, the Tu'i Kanokupolu, from the Tu'i Ha'atakalaua, marked another phase of secularization among an emerging politically powerful Tongan lineage (Bott 1982; Gifford 1929; Herda 1988). By creating new niches for competing siblings, two things happened: the Tu'i Tonga and Tu'i Ha'atakalaua again quelled the ambitions of younger kinsmen by providing them with powerful positions, while at the same time they maintained differential access to resources themselves. At the time of European contact, the Tu'i Ha'atakalaua was gradually coming to be regarded as a "divine king," a kind of junior Tu'i Tonga, while the Tu'i Kanokupolu assumed the responsibilities of the "working king." Herda (1988:86) writes: "It seems likely that the peaceful days, often nostalgically referred to as Tonga's 'golden age,' began during the tripartite rule of the Tu'i Tonga Fakana'an'a, the Tu'i Ha'atakalaua Kafoamotalau, and Tu'i Kanokupolu Vuna." Here was another instance of an elite stepping aside from direct authority in favor of a junior kinsmen while supporting the ruling chief and maintaining access to tribute.

This same process of competition from junior lines intensified rivalries among the elites who aspired to take over the ruling lines. This prompted the new *hau* or secular chief, the Tu'i Kanokupolu, to send younger and more aggressive chiefs away (and in so doing deflected direct competition) to control the outer islands (Kirch 1984:235; Mahina 1986). Alternatively, some individuals, especially those more distantly related to the sacred lines of the founding Tu'i Tonga, were excluded over time from the highest chiefly positions (Marcus 1988:204). This suggests that as the ruling lineages expanded collaterally, those individuals and families most junior and most removed in generational time from the senior and founding lineage gave up a number of their privileges, including access to the flow of tribute.

Again, this split among the two secular ruling lineages is marked archaeologically at the ceremonial complex, first by the addition of a fortification wall and moat to the west of Lapaha and adjoining the original fortification. This wall extends to the west and then north to the edge of the coast. Within this area was located the dwelling of this lineage's chief, surrounded by a fence. There was also a priest's house, a sleeping house for the oldest unmarried son and a similar structure for the oldest unmarried daughter, and a guest house.

ENCOURAGING RIVAL SIBLINGS TO ENGAGE IN COLONIZATION AND EXPANSIONIST WARFARE

The hierarchical structure of Tongan society, even with the additional senior lineages, precluded the political ascension of all members of ruling chiefly families. While the establishment of new political niches relieved tension between ruling elites, it did not entirely remove the threat of usurpation by relatives. Although close kinsmen may ensure cooperative relations with ruling members, they can likewise become their closest competitors in the face of dwindling opportunities for resources, or when fitness enhancement through the usurpation of power is seen as a possibly successful strategy. Therefore, it is up to the ruling elites to persuade junior kinsmen to maintain an affiliate relationship, through the issuance of either *tangible* or *artificial* currencies. The former is the actual allotment of

resources, such as land and/or authority, while the latter (Boone 1983) entails ideological manipulations, such as encouraging junior kinsmen to wage expansionist warfare in the name of religion.

Abating political tension and simultaneously preserving political cohesion of the Tongan empire was achieved by sending political rivals away from the political center at Tongatapu and providing them with new titles and opportunities for political expansion, or a tangible currency. Kirch (1984:235) asserts that "the logic of alliances underlying the political network which bound the Tongan 'maritime empire' together should be clear. *Tehina*, junior brothers or kinsmen of the ruling elites, were placed at critical points on the outer islands, where they would marry into local chiefly lines and supplant the former, now conquered, autochthonous chiefs." This strategy prompted the expansion of the Tongan polity throughout western Polynesia. Lesser chiefs were sent to or would themselves seek islands where they could become supreme political leaders, adopting Tongan titles. This strategy of placing junior relatives on neighboring islands was continued by the Tu'i Ha'atakalaua line as well as the Tu'i Kanokupolu line, where their kin occasionally reestablished Tongan authority or married into established chiefly lineages. This, of course, must have been encouraged by the ruling elites who provided the technology (canoes), navigators, and manpower (warriors) to proceed in interisland conquest.

Throughout the western Pacific, oral traditions tell of invading Tongan expeditions (e.g., Firth 1970; Ferdon 1987). The most noted of all Tongan epic conquests is that of the twenty-fourth Tu'i Tonga, Kau'ulufonua fekai. After the assassination of Takalaua, Kau'ulufonua fekai swore to avenge his father's death. He is said to have pursued the assassins from island to island, through Vava'u, Ha'apai, Niuatoputapu, Niuafo'ou, Samoa, Futuna, Fiji, and lastly to 'Uvea, where he killed his father's murderers. This event appears to mark the beginning aggression-based expansion of Tongatapu, during which Tongans were sent to live on the conquered islands (Bott 1982; Gifford 1924; Goldman 1970; Kirch 1984). Herda (1990), on the other hand, has suggested that the inclusion of the main Tongan island groups and the outliers of Niuafo'ou and Niuatoputapu within a centralized Tongatapu polity during the expansion of Kau'ulufonua fekai may be nothing more than the formalization of a long-standing relation between these islands (quoted in Pollock 1996).

Other islands in the western Pacific, including 'Uvea (Burrows 1936; Pollock 1996), Rotuma (Gifford 1929), and Futuna (Gifford 1929; Guiart 1963, cf. Burrows 1936), seem to have been integrated, or at least substantially influenced, by the expanding Tongan empire before and during the reign of Kau'ulufonua fekai, dated to the fifteenth to sixteenth centuries A.D. Tongan intrusion not only affected the northern outliers of west Polynesia but may have extended east to Niue, and possibly as far as Rarotonga in the Cook Islands (Loeb 1926). Northward, beyond Futuna and Rotuma, Tongans are said to have traveled as far as Tokelau (Macgregor 1937) and Pukapuka (Beaglehole and Beaglehole 1938; Goldman 1970), and as oral traditions suggest, they could have reached the shores of Anuta (Feinberg 1989), Tikopia (Firth 1961), and Sikaiana (Woodford 1906) in the Solomon Islands (see Table 1). Evidence for such distant voyages has not yet been reasonably well established, although it is plausible that the western Pacific Polynesian outliers may have been visited and possibly colonized by deposed

TABLE 1. EVIDENCE FOR TONGAN EXPANSIONISM IN WESTERN-CENTRAL POLYNESIA AND EASTERN MELANESIA BETWEEN THE TWELFTH AND NINETEENTH CENTURIES

ISLAND	HISTORICAL ACCOUNTS	ORAL TRADITIONS	LINGUISTIC EVIDENCE	ARCHAEOLOGICAL EVIDENCE
Niuatoputapu	Schouten meets Tongan Viceroy in 1616 (Kirch 1988*b*; Langdon 1977)	Speak of ancestral Tongan connection (Bott 1982)	Speaking Tongan dialect in 1767 during Willis' visit (Biggs 1980; Dye 1980)	Tongan field monuments built around the 17th century (Kirch 1977, 1988*b*)
Niuafo'ou	Niuafo'ou pays tribute to Tonga (Kirch 1984)	Fotofili from Tonga comes to Niuafo'ou during the expansion by Kau'ulufonua fekai (Bott 1982)	Tongan language forms found in Niuafo'ou speech (Collocott 1922; Dye 1980)	
'Uvea	Missionary accounts suggest that 'Uvea pays tribute to Tonga (Urbanowicz 1973, quoted in Kirch 1984)	Tongan connection during Tauloko's reign in the 12th century. Renewed contact during Kau'ulufonua fekai's expansion (Burrows 1937)	Uvean heavily borrows from Tongan possibly in the 15th century (Biggs 1980; Pawley 1966)	Large earthworks of Tongan style (Kirch 1988*b*; Sand 1993)
Rotuma	Dillon observes Rotumans paying tribute to Tongans in the early 19th century (Gifford 1929) and labor is conscripted from the island by Tongans (Eason 1951)	Island conquered by Niuafo'ou chief possibly from Tonga (Howard 1991)		Tongan style burial monuments (Ladefoged 1993*a*)
Futuna	In 1616 Le Maire encounters Tongan Viceroy in Futuna (Gifford 1929; Guiart 1963). Vason encounters Tongans in Futuna in 1810 (Vason 1810)	Futunan oral tradition speaks of a couple of Tongan invasions (Burrows 1936)		Tongan monumental-style mounds found in Futuna (Kirch 1976)
Fiji	Tongans tell Cook of frequent contact between Tonga and Fiji (Langdon 1977)	Oral tradition speaks of two important Tongan migrations in the 13th and 16th centuries (Derrick 1946)	Many Tongan name places of Fijian origin (Derrick 1946)	Similar architectural forms to Tongan; pottery from Lau in Tonga (Dye and Dickinson 1996; Tippit 1968)
Samoa	In 1824 von Kotzebue saw that the chief in Samoa was a Tongan high chief (Henry 1980; Gunson 1990)	Links between Tonga and Samoa are very ancient and recognized by the mythology of both archipelagos (Gunson 1990)		Samoan basalt and obsidian in Tonga (Clark et al. 1997)

(*Continues*)

TABLE 1. *Continued.*

ISLAND	HISTORICAL ACCOUNTS	ORAL TRADITIONS	LINGUISTIC EVIDENCE	ARCHAEOLOGICAL EVIDENCE
Niue	Tongans tell Anderson of Niue in 1773 (Ferdon 1987)	Migrations and invasions from Tonga during the 16th and 17th centuries (Loeb 1926)		
Pukapuka		Chiefly line founders come from Tonga 22 generations ago (Beaglehole and Beaglehole 1938)		
Tokelau	Tokelau appears on Tongan list of known islands (Cook and King 1784)	Tokelauan traditions speak of contact with Tonga (Macgregor 1937)		Similar architectural style, and possibly basalt from Samoa
Anuta	In 1810 Capt. Dillon hears from Anutans that Tongans had invaded Anuta in the past (Feinberg 1989)	Anutan oral traditions claim that Pu Kaurave, a Tongan chief, founded a local chiefly line (Feinberg 1989)	Anutans call their double canoes "*te tongiaki*" which is the same name the Tongans gave their double-hulled canoes (Feinberg 1989)	Political structure and architecture in Anuta and Tonga share similarities (Kaeppler 1973*a*; Kirch and Yen 1982)
Tikopia	Tikopians tell Dillon that Tongans had invaded them in the past (Feinberg 1989)	Tikopia accounts tell of immigrants coming from Tonga, 'Uvea, and other West Polynesia homelands (Firth 1961)	Tongan name for burial mound is "*fa'itoka*," which appears in Tikopia as the name of "*muafaitoka*"	Use of quarried coral conglomerate as building material. The technique is associated with Tongan building techniques (Kirch and Yen 1982)
Sikaiana		Sikaianans tell of Tongan attacks. They build fortifications throughout the island (Woodford 1906)		

chiefs in search for land and resources. Through their northernmost domains, such as 'Uvea, Tongan chiefs may well have extended the political hegemony of the Tongan empire across the western Pacific into Melanesia (see Pollock 1996 : 442, and Table 1). It is significant to note that the time frame in which Tongan maritime expansionism is most acute, around the sixteenth through the nineteenth centuries A.D., would coincide with ethnohistorical accounts of a highly populated and intensively cultivated Tongatapu (e.g., Cook and King 1784; Beaglehole 1969).

The second strategy by which younger and more aggressive chiefs were sent away to control the outer islands was through the issuance of "artificial" currencies (Boone 1983). A good example of this strategy is recorded in the accounts of sending Ma'afu to Fiji. In 1845, Aleamotu'a died having named Taufa'ahau as his successor. Many chiefs who did not submit to the new ruler left for Fiji, which became a caucus for defecting chiefs and warriors from Tonga. Taufa'ahau's succession was not undisputed, for Ma'afu, his younger kinsman, had as much of a claim as Taufa'ahau. Foreseeing a possible alliance between Ma'afu and the dissatisfied chiefs in Fiji, Taufa'ahau decided to send Ma'afu as his emissary to organize a Tongan colony in Fiji. Taufa'ahau used Christianity and the spread of the gospel to instigate Ma'afu to convert nonabiding Fijian chiefs to the new religion. It was ideological manipulation, or the issuance of an "artificial currency," that prompted Ma'afu to sail on to Fiji. By sending Ma'afu to Fiji, Taufa'ahau solved three major problems: (1) he rid himself of his most dangerous rival by providing him authority and a title, (2) he organized the freelance warriors and chiefs by sending a popular noble to control them; and (3) he ensured that Fijian chiefs would remain affiliated with Tonga rather than becoming its aggressors. Ma'afu was dispatched in 1848 with a force of soldiers strong enough to enforce his authority in Lakemba, of the Lau Islands of eastern Fiji. Yet, Ma'afu realized material advantages beyond the artificial currency of missionization. He was given the responsibility to rule all Tongans in Fiji and even possibly to conquer and unify Fiji with Tonga into a central Pacific empire (Derrick 1946; Lessin and Lessin 1970).

Archaeological efforts to confirm the timing and sequence of Tongan influence and political expansion beyond Tongatapu have been relatively limited. Surveys of burial mounds in the islands of the Ha'apai group (Burley 1991, 1992), in the Vava'u group (Davidson 1971; Kirch 1980), at Niuatoputapu (Rogers 1974; Kirch 1988*b*, 1990*b*), on 'Uvea (Frimigacci et al. 1984; Kirch 1976; Sand 1993), on Futuna (Kirch 1976), and on Rotuma (Ladefoged 1993*a*) all have shown similar construction features, including the use of coral perimeter construction slabs (sometimes cut and dressed, occasionally fitted) in rectilinear plans with the interiors filled by volcanic sediments and/or coral sands within which slab-lined burial pits may be recognized. Anecdotal observations of similar features in the Tokealu Islands (Macgregor 1937), and Fiji (McKern 1929 : 121), as well as shared architectural construction characteristics in Tikopia (Kirch and Yen 1982), Anuta (Kirch and Yen 1982), the Lau Islands (Hocart 1929), and throughout Fiji (Tippett 1968 : 9) suggest that prehistoric interaction related to the Tongan expansion may have been more widespread. Davidson (1971), Rogers (1974), and Kirch (1976, 1980, 1988*b*) have developed or tested classifications of these architectural features, but as yet we have no analyses that would separate functional

TABLE 2. SERIATION OF TONGATAPU BURIAL MOUND ARCHITECTURAL TRAITS (FROM MCKERN 1929)

	PLAN VIEW[a]		SIDE VIEW[b]		
FEATURE	UPPER ROUNDED	LOWER RECTILINEAR	CONE	ROCK-FACING[c]	MULTIPLE LEVELS[d]
Matamoana, Makamaka	•	–	•	–	–
Lili	–	•	•	–	–
Tafaua, Loamanu	–	•	•	•	–
Tuofefafa, Heketa, Leka	–	•	•	•	•
Paepaetelea	–	•	–	•	•
Moungaleta	–	•	–	•	–

• Present; – Absent
[a] Perspective from above, at base of mound, and at top of mound
[b] Perspective from side view
[c] Occurrence of dressed rock or natural rock slabs as perimeter-facing
[d] Occurrence of multiple-faced levels

from stylistic dimensions and apply them systematically to this widespread and nonportable artifact in order to track their appearance and change in time and space. Such an effort by archaeologists would be well repaid, for it would provide an independent and reliable test of the dating, directionality, and degree of similarity among architectural traits thought to have originated in Tongatapu.

Working with the descriptions and illustrations of elite burial mounds provided by McKern (1929:36–62), it is possible to develop a seriation (Table 2) that may order these features by relative age. This ordering is largely consistent with the associated genealogical order provided by Kirch (1984:229–230) for named rulers said to be interred within a number of the burial mounds from Lapaha. As noted previously, all the burial mounds recorded for Tongatapu by McKern can be ordered into a single chronology by this seriation, suggesting that no geographic or social barriers to interaction and the spread of stylistic traits is represented here. Additionally, this ordering of burial mounds places nonrectilinear forms later in time than the well-known rectilinear forms on Tongatapu (and this would seem to confirm McKern's observations [1929:72–75] regarding architectural change). In this seriation, rectilinear plan view and rock-faced burial mounds are dated to the twelfth through the sixteenth centuries (based on genealogical information). Such forms also occur in the Ha'apai and Vava'u groups, suggesting their early incorporation into the Tongatapu polity. The diffusion of such forms was somewhat later to other islands, as suggested by similar features from Niuatoputapu (sixteenth to eighteenth centuries, see Kirch 1988*b*), 'Uvea (fifteenth to seventeenth centuries, see Sand 1993) and possibly Rotuma (Ladefoged 1993*a*).

While we do not undertake an exhaustive analysis of burial features from Tonga, this example suggests one way in which such features might be sequenced and in which the distribution of different types could be tracked across the different island groups of Tonga and elsewhere in west Polynesia. With associated radiocarbon dates, it would be possible to identify the interaction sphere and the hegemonic integration of other islands with Tongatapu. Such an approach may be extended to the other architectural forms in west Polynesia. If so, it would

then be possible to test Green's (1993 : 10–11) view that new forms were innovated in west Polynesia and reflect the domination of places such as Tongatapu in the region's late prehistory.

TRADE AND THE INSTITUTIONALIZED EXCHANGE OF HIGH-RANKING SPOUSES

Ecologically speaking, trade is a risk-adverse strategy to counter spatiotemporal resource stochasticity, particularly under conditions where agriculture is rainfall-dependent, droughts are recurrent, population size has increased, and competition has escalated (Cashdan 1987; Coombs 1980). However, trade may also serve particular individuals as a strategy by enhancing their competitive ability and/or deflecting competition. Colinvaux (1982) has suggested that formal trade is not conducted for the general benefit of consumers but, rather, to serve powerful individuals' access to and control of key resources, while simultaneously creating new niches for close competitors. In the Tongan case, not only did inter-archipelago trade serve as a risk-minimization strategy, but it allowed powerful individuals to monopolize certain resources (e.g., canoes) and remove close competitors by relocating them to other islands, to obtain new resources, and to acquire foreign spouses through intermarriage.

When Europeans first reached Tonga, they not only encountered a large and powerful chiefdom on Tongatapu, but one which served as the most central and important node in a wide exchange network linking numerous islands of west Polynesia (Hage and Harary 1996 : 118; Kirch 1988*b*). Its scale in terms of exchange extended 900 km from west to east and 900 km from north to south, making the total area approximately 800,000 km^2. This occurred, as previously suggested, because of the locational advantages that Tongatapu possessed with respect to voyaging and also because the effects of resource variability were likely experienced earlier and more pervasively on Tongatapu compared to other islands in west Polynesia.

Not only were chiefs from Tongatapu trading with these islands, but in some instances they exerted some level of political influence over them. For instance, chiefs from Ha'apai and Vava'u offered tribute to Tongatapu and goods from 'Uvea and Niuafo'ou made their way to the paramountcy in Tongatapu (Urbanowicz 1973). Stones from 'Uvea are said to have been transported to Tongatapu for use in burial mound construction (Pollock 1996). Although evidence for a continuous exchange system between Tonga and the rest of west Polynesia cannot be established solely by the existing archaeological evidence, Davidson (1978, 1979) suggests that an earlier Lapita trade or interaction network existed, evidenced by similar pottery sequences throughout Tonga, Samoa, Fiji, Futuna, and 'Uvea. After the ostensible breakdown of this network, however, various islands and island groups in west Polynesia became more isolated until the Polynesian descendants of the original Lapita settlers increased intergroup contact (Groube 1971) at the end of the first or beginning of the second millennium A.D. (Kirch 1984). Best et al. (1992) and Clark et al. (1997) identify adze-quality basalt from Samoan quarries in Fiji, Tonga, the Tokelaus, and Tuvalu and suggest that transport of these materials occurred within the last 300–600 years. Leach (1993) adds Tikopia, Anuta, and Ponape to the list of islands where Samoan basalt was

possibly transported. Much of this material would have been moved through the Tongan maritime network. Other archaeological materials that have been sourced from one archipelago to another include later (i.e., non-Lapitoid) pottery from eastern Fiji in Tonga (Dye 1987; Dye and Dickinson 1996 : 160; Kaeppler 1973*b*; Kirch 1988*b*) and obsidian from Niuatotapu (Kirch 1988*b* : 254). Regardless of whether the later trade network was continuous over time with Lapita, Tonga maintained ties with Samoa and Fiji at the time of European contact, and archaeological research documents the movement of staple goods (see Earle 1997) during the late prehistoric and early historic period; this is also supported by ethnohistorical studies (Henry 1980; Gunson 1990).

Tongans were skilled navigators; their myths and oral traditions are full of references to voyaging for warfare, trade, and adventure (e.g., West 1865). The development of large voyaging canoes, or *tongiaki*[3] (Haddon and Hornell 1936; Lewis 1972), allowed Tongan chiefs to enlarge the scale and scope of the polity centered at Tongatapu by moving more warriors in raiding, transplanting junior chiefs, and transporting various kinds of staple and wealth goods through trading across the western Pacific. The fact that Tongan individuals and actual colonies were repeatedly spread throughout many islands indicates that the development of seaworthy fishing and voyaging vessels had permitted an outward movement (Tippet 1968; Ferdon 1987). Tongan canoes were very large, ranging between 20 and 35 m (60–110 ft [Lewis 1972]). Ethnohistorical accounts report that the largest of these vessels were able to carry between 90 and 250 people. The first Europeans to visit Tonga, among them Le Maire in 1616 and Cook in 1777, reported that Tongan vessels ranged between 10 and 25 m (30–70 ft) and carried up to 150 people (Derrick 1946; Ferdon 1987). By the mid-nineteenth century canoes were observed to be as large as 30 m (100 ft) and able to carry hundreds of people (Sterndale 1874 : 4). Apparently, Tongan canoes had increased in size by the borrowing of technology and trade for suitably sized woods from the Fijians and the incorporation of these resources to meet the objectives of Tongan maritime interests. This was no accident, as Tongan chiefs were engaged in the periodic movement of junior chiefs to outer islands and were often in need of warriors to support their overseas claims, which required larger vessels capable of carrying greater numbers of individuals for such colonization and invasion attempts, especially in Fiji (Derrick 1946; Ferdon 1987).

Prior to the introduction of European goods, Tonga was trading with Fiji mats obtained from Samoa, coconut-fiber cordage, and, most important of all, whale teeth, which were highly prized by Fijian chiefs. In exchange for the Tongan goods, highly valued Fijian red feathers, some pottery, sails, and mosquito curtains were exchanged (Derrick 1946; Ferdon 1987; Tippet 1968). By the end of the eighteenth century, however, the most valuable items that Fiji could offer were their finer crafted *ndrua* canoes. Tongans would sail upwind to Lakemba and arrange with the local chiefs for the exchange of logs and food in return for Tongan bark cloth, weapons, and services in war (Hocart 1929, 1952; Thompson 1940). Kirch (1984 : 237–240) suggests that the demand for Fijian canoes increased as the Tongan paramountship needed to maintain tributary relations between the outlying islands and Tongatapu and that this led to the intensification of Tongan-Fijian exchange. The key aspect of this observation is that voyaging canoes were excludable resources that had been appropriated by Tongan ruling elites to

extend the dominance of their chiefdoms and to direct competition from within the polity to interisland trade and intergroup aggression and expansionist warfare.

One final strategy by which higher chiefs redirected intragroup competition was through the exchange of spouses between Tonga, Samoa, and Fiji. This pattern of exchange has been analyzed primarily from a structural perspective (Kaeppler 1978; Kirch 1984:225–226, 1988*b*:8–12). Samoa became the source for female spouses, giving high-ranking women to Tongan chiefs as a way to solidify political relations between Tonga and Samoa. Fiji, on the other hand, became a giver of male spouses, generally to high-ranking Tongan women (Kaeppler 1978). Because the sister of the Tu'i Tonga (Tu'i Tonga Fefine) held a higher social rank than her brother, allowing for her offspring to outrank the Tu'i Tonga himself, Tu'i Tonga Fefine were married to Fijian chiefs. This strategy diminished the likelihood of future succession conflicts between the higher ranking sons of the Tu'i Tonga Fefine and those of the Tu'i Tonga, because the Tu'i Tonga Fefine's children became part of their foreign fathers' lineage (Kaeppler 1971; Kirch 1984:226). In this manner, Tongan chiefs redirected possible future internal conflict against their paramountcy, while making allies of foreign chiefs and improving the chances for the continuation of their lines. The reciprocal exchange of spouses (including multiple wives) was also practiced between Tongatapu and its tributary islands; this strategy served to bind the outer islands to the central power in Tongatapu while providing enhanced status to the chiefly lines on those islands (Kirch 1984:241).

CONCLUSIONS

The environmental and locational structure (some of it created) that characterizes Tongatapu in the second millennium A.D. is a significant aspect of the evolutionary ecology of Tongan social complexity. It explains why ruling individuals in Tonga opted for strategies to redirect their closest competitors, and possible aggressors, away from themselves. The development of Tongan political and territorial integration and the concomitant expansionist warfare between the twelfth and nineteenth centuries resulted from two integral and inflationary processes: intra- and intergroup competition. The dialectical interaction of these two mechanisms on Tongatapu led first to localized political integration and class differentiation and then to the development of collateral ruling lines. Expansionist practices included overseas interaction spheres, junior chiefs engaged in warfare, and trade in staples, wealth, and spouses. Ruling elites were able to monopolize critical wealth resources; they undertook the incorporation and development of voyaging technology and engaged in a substantial exchange of staples. At the same time, they focused intragroup aggression away from themselves toward neighboring polities by creating new aristocratic titles, encouraging close kin to engage in expansionist warfare, and promoting interisland trade and interarchipelago exchange of spouses. Tongan hegemony in western Polynesia was cemented by the development of voyaging canoes and their appropriation by ruling elites.

Traditionally, Pacific islands scholars have attributed cultural change and the rise of complex societies in Polynesia to a combination of environmental circumstances, population growth, agricultural intensification, and warfare. Insular ecology has

been identified as the major variable conditioning and constraining the sociopolitical development of Oceanic societies. What has been lacking, however, are the delineation of strategies and specific mechanisms linked to these factors that would explain why human behavior results in the formation of complex societies. The approach and the synthesis presented in this paper clearly builds on the important work of Kirch and others, but differs from this body of scholarship because it focuses on identifying a mechanism, selection, to explain why (i.e., the ultimate causation) complex societies emerged and persisted in Polynesia. Complex chiefdoms in Polynesia formed as the result of individuals' aggregate competitive and cooperative behavioral strategies to enhance their inclusive fitness. Those strategies that maximized resource access and control and simultaneously minimized risk, bodily injury, or elimination were favored, and hence persisted and proliferated. For the evolution of social complexity, these included competitive strategies that favored certain individuals and their families and provided them with positions of authority and privilege. But we also saw in the case of Tonga how cooperative strategies, especially involving the removal of close kin from direct competition with their relatives and the separation of new duties and responsibilities by different lineages, were adopted by the ruling elites on Tongatapu.

We would not claim that selectionist arguments alone can explain all the sociocultural diversity of human societies or provide the only acceptable mode of anthropological interpretation. However, we do support the application of Darwinian models in Oceania to examine the existence and persistence of specific human behavioral traits. Selectionist models, such as the one presented in this paper, can provide an integrated, dynamic, and theoretically driven account of the evolution of social complexity and the geographical expansion of Polynesian populations. Furthermore, these models afford an alternative explanation to the organismic tradition of cultural evolution at the level of societies. We attempt to provide a clear theoretical basis for the analysis of both ethnohistorical and archaeological data. One of the highlights of this research is that it refocuses attention on several important questions for archaeology in west Polynesia involving the timing, duration, and nature of Tongan integration and expansion into other island groups and archipelagos. These are resolvable empirically through paleoenvironmental research, stylistic and functional analyses of architectural variation, and the analysis of compositional variability of various lithic materials (including, we expect, the building materials used in burial mounds) and other resources that are recoverable in the archaeological record. This should allow archaeologists to more realistically evaluate the relative timing and importance of the different behavioral strategies identified in this paper and hence the assessment of the theoretical model offered at the outset. This is ultimately the value of an evolutionary framework. It can provide a fresh outlook on what might have been otherwise thought to be known: the study of the historical development of complex chiefdoms in Polynesia and elsewhere in Oceania.

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NOTES

1. The extensive research by Patrick Kirch has been invaluable for this study. He describes a number of salient aspects of Tongan history and archaeology, internal and external political relationships, and environmental and social features.
2. The historical validity of oral traditions has been explored by Tonga scholars such as Bott (1981, 1982) and Herda (1988). Herda (1988 : 156), in accounting for the sources of her own research, remarks that "for the most part, the details of Tongan traditions cited appear constant in all versions consulted." Recently, Cachola-Abad (1998) has defended the use of oral traditions as a source of historical data. She argues that Hawaiian ethnohistorical data recorded during the nineteenth century are highly consistent across sources, thus allowing for the application of oral traditions to the study of the evolution of Hawaiian sociopolitical complexity. In a similar fashion, oral traditions (among other data) are used in this analysis since in recent decades archaeology and historical linguistics in Tonga have been consistent, for the most part, with ethnographic evidence and oral traditions, which, as Feinberg (1989) suggests, provide a "major outline" in examining settlement patterns and prehistoric interisland contact.
3. The use of the *tongiaki* double-hulled canoe dates back to at least the seventeenth century, well before the Tongans had acquired the allegedly superior Fijian *ndrua* in the nineteenth century. In 1616, two Dutch ships, the *Eendracht* and the *Hoorn*, under the command of Jacob Le Maire, entered the Pacific. On May ninth the crews of the European vessels were able to see two large double-hulled vessels bounded north, probably to Samoa (Kirch 1988*b*). The *tongiaki* were able to travel between Fiji, Samoa, Niuatoputapu, and other islands well beyond Tongatapu. Le Maire's encounter seems to verify that voyaging between these islands was established by at least 1616.

REFERENCES

Afeaki, E.
1983 Tonga: The last Pacific kingdom, in *Politics in Polynesia*: 57–80, ed. R. Crocombe and A. Ali. Suva: Institute of Pacific Studies, University of the South Pacific.

Alexander, R. D.
1974 The evolution of social behavior. *Annual Review of Ecology and Systematics* 5 : 325–383.

Allen, M. S.
1996 Style and function in east Polynesian fish hooks. *Antiquity* 70 : 97–116.

Beaglehole, E., and P. Beaglehole
1938 *Ethnology of Pukapuka.* B. P. Bishop Museum Bulletin 150.

Beaglehole, J. C.
1969 *The Journals of Captain James Cook on His Voyages of Discovery,* Vol. 2. Cambridge: Hakluyt Society.

Bellwood, P.
1978 *The Polynesians: Prehistory of an Island People.* London: Thames and Hudson.

Best, S., P. Sheppard, R. C. Green, and R. Parker
1992 Neoromancing the stone: Archaeologists and adzes in American Samoa. *Journal of the Polynesian Society* 101 : 45–85.

Biggs, B.
1980 The position of East Uvean and Anutan in the Polynesian language family. *Te Reo* 23 : 115–134.

Boone, J. L.
1983 Noble family structure and expansionist warfare in the late Middle Ages: A socio-ecological approach. In *Rethinking Human Adaptation: Biological and Cultural Models*: 79–96, ed. R. Dyson-Hudson and M. A. Little. Boulder: Westview Press.

1992 Competition, conflict, and the development of social hierarchies. In *Evolutionary Ecology and Human Behavior*: 301–337, ed. E. A. Smith and B. Winterhalder. New York: Aldine de Gruyter.

BOTT, E.
1981 Power and rank in the Kingdom of Tonga. *Journal of the Polynesian Society* 90 : 7–81.
1982 *Tongan Society at the Time of Captain Cook's Visits: Discussions of Her Majesty Queen Salote Tupou*. Memoir 44. Wellington, New Zealand: The Polynesian Society.

BURLEY, D. V.
1991 Archaeological research in the Ha'apai Islands, Kingdom of Tonga: A report on the 1990 field season. Prepared for Prime Minister's Office, Nuku'alofa, Kingdom of Tonga.
1992 Archaeological research in the Ha'apai Islands, Kingdom of Tonga: Activities of the 1991 field season. Prepared for the Prime Minister's Office, Nuku'alofa, Tonga.
1994 Settlement pattern and Tongan prehistory: Reconsiderations from Ha'apai. *Journal of the Polynesian Society*. 103 : 504–517.

BURROWS, E. G.
1936 *Ethnology of Futuna*. B. P. Bishop Museum Bulletin 138.
1937 *Ethnology of Uvea*. B. P. Bishop Museum Bulletin 145.

CACHOLA-ABAD, C. K.
1998 An evolutionary analysis of Hawaiian oral history for Hawai'i Island. Paper developed for the Forum on Evolutionary Theory in Oceania: Applications to the Archaeological, Linguistic, and Ethnohistorical Records. Sixty-Third Annual Meeting of the Society for American Archaeology, Seattle, Washington.

CARNEIRO, R. L.
1970 A theory of the origin of the state. *Science* 169 : 733–738.
1972 From autonomous village to the state, a numerical estimation. In *Population Growth: Anthropological Implications*: 64–77, ed. B. Spooner. Cambridge: Massachusetts Institute of Technology Press.

CASHDAN, E.
1983 Territoriality among human foragers: Ecological models and an application to four Bushman groups. *Current Anthropology* 24 : 47–66.
1987 Trade and its origins on the Botletle River, Botswana. *Journal of Anthropological Research* 43 : 121–138.
1992 Spatial organization and habitat use. In *Ecology, Evolution, and Human Behavior*: 237–266, ed. E. A. Smith and B. Winterhalder. New York: Aldine de Gruyter.

CLARK, J. T., AND J. TERRELL
1978 Archaeology in Oceania. *Annual Review of Anthropology* 7 : 293–319.

CLARK, J. T., E. WRIGHT, AND D. J. HERDRICH
1997 Interactions within and beyond the Samoan archipelago: Evidence of basaltic rock geochemistry. In *Prehistoric Long-Distance Interaction in Oceania: An Interdisciplinary Approach*: 85–110, ed. M. I. Weisler. Monograph 21. Auckland: New Zealand Archaeological Association.

COCHRANE, E. E.
1998 Measuring and explaining homologous similarity in Oceania: A case study from Society Islands' *marae*. Paper developed for the Forum on Evolutionary Theory in Oceania: Applications to the Archaeological, Linguistic, and Ethnohistorical Records. Sixty-Third Annual Meeting of the Society for American Archaeology, Seattle, Washington.

COLINVAUX, P.
1982 Towards a theory of history: Fitness niche, and clutch of *Homo sapiens L. Journal of Ecology* 70 : 393–412.

COLLOCOTT, E. E. V.
1922 The speech of Niua Fo'ou. *Journal of the Polynesian Society* 31 : 185–189.

COOK, JAMES, AND JAMES KING
1784 *A Voyage to the Pacific Ocean in the Years 1776–80*. London: G. Nicol and T. Cadell.

COOMBS, G.
1980 Decision theory and subsistence strategies: Some theoretical considerations, in *Modeling Change in Prehistoric Subsistence Economies*: 187–208, ed. T. K. Earle and A. L. Christenson, New York: Academic Press.

CORDY, R.
1981 *A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands*. New York: Academic Press.

DAVIDSON, J. M.
1971 Preliminary report on an archaeological survey of the Vava'u group, Tonga. In *Cook Bicentenary Expedition in the Southwest Pacific*: 29–40, comp. R. Fraser. Bulletin 8. Wellington: Royal Society of New Zealand.
1977 Western Polynesia and Fiji: Prehistoric contact, diffusion, and differentiation in adjacent archipelagos. *World Archaeology* 9 : 9.
1978 Western Polynesia and Fiji: The archeological evidence. *Mankind* 11 : 383–390.
1979 Samoa and Tonga, in *Prehistory of Polynesia*: 82–109, ed. J. Jennings. Cambridge: Harvard University Press.

DECKTOR-KORN, S. R.
1974 Tongan kin groups: The noble and the common view. *Journal of the Polynesian Society* 83 : 5–11.
1978 Hunting the ramage: Kinship and the organization of political authority in aboriginal Tonga. *The Journal of Pacific History* 13: 107–113.

DERRICK, R. A.
1946 *A History of Fiji*, Vol. 1. Suva: Government Printing Press.

DUNNELL, R. C.
1980 Evolutionary theory and archaeology, in *Advances in Archaeological Method and Theory*, Vol. 3: 35–99, ed. M. B. Schiffer. New York: Academic Press.

DURHAM, W.
1976 Resource competition and human aggression, part I: A review of primitive war. *The Quarterly Review of Biology* 51 : 385–415.

DYE, T. S.
1980 The linguistic position of Niuafo'ou. *Journal of the Polynesian Society* 89 : 349–357.
1987 Social and Cultural Change in the Prehistory of the Ancestral Polynesian Homeland. Ph.D. diss. Yale University, New Haven, Conn.

DYE, T. S., AND W. R. DICKINSON
1996 Sources of sand tempers in prehistoric Tongan pottery. *Geoarachaeology* 11 : 141–164.

DYSON-HUDSON, R., AND E. A. SMITH
1978 Human territoriality: An ecological reassessment. *American Anthropologist* 80 : 24–41.

EARLE, T.
1991 The evolution of chiefdoms, in *Chiefdoms: Power, Economy, and Ideology*: 1–15, ed. T. Earle. New York: Cambridge University Press.
1997 Exchange in Oceania: Search for evolutionary explanations, in *Prehistoric Long-Distance Interaction in Oceania: An Interdisciplinary Approach*: 224–237, ed. M. I. Weisler. Monograph 21. Auckland: New Zealand Archaeological Association.

EASON, W. J. E.
1951 *A Short History of Rotuma*. Suva: Government Printing Department.

FEINBERG, R.
1989 Possible prehistoric contacts between Tonga and Anuta. *Journal of the Polynesian Society* 98 : 303–317.

FERDON, E. N.
1987 *Early Tonga: As the Explorers Saw It*. Tucson: The University of Arizona Press.

FIELD, J.
1988 Natural and constructed defenses in Fijian fortifications. *Asian Perspectives* 37 : 32–58.

FIRTH, R.
1961 *History and Traditions of Tikopia*. Memoir 33. Auckland: The Polynesian Society.
1970 The analysis of mana: An empirical approach, in *Cultures of the Pacific*: 316–333, ed. T. Harding and B. Wallace. New York: The Free Press.

FLANNERY, K. V.
1972 The cultural evolution of civilizations. *Annual Review of Ecology and Systematics* 3 : 399–426.

FRIMIGACCI, D., J. P. SIORAT, AND B. VIENNE
1984 *Inventaire et fouille des sites archèologiques et ethnohistoriques de l'île d'Uvea.* Nouméa, New Caledonia: Centre ORSTOM de Nouméa.

FROST, E.
1979 Fiji. In *The Prehistory of Polynesia*: 61–81, ed. J. Jennings. Cambridge: Harvard University Press.

GIFFORD, E. W.
1924 *Tongan Myths and Tales.* B. P. Bishop Museum Bulletin 8.
1929 *Tongan Society.* B. P. Bishop Museum Bulletin 61.

GOLDMAN, I.
1955 Status rivalry and cultural evolution in Polynesia. *American Anthropologist* 57 : 680–697.
1970 *Ancient Polynesian Society.* Chicago: University of Chicago Press.

GOLSON, J., ED.
1962 *Polynesian Navigation: A Symposium on Andrew Sharp's Theory of Accidental Voyages.* Memoir 34. Wellington, New Zealand: The Polynesian Society.

GOODENOUGH, W.
1957 Oceania and the problem of controls in the study of cultural and human evolution. *Journal of the Polynesian Society* 66 : 146–155.

GRAVES, M. W., AND C. K. CACHOLA-ABAD
1998 The evolution of social groups in Hawai'i: Testing models in archaeology. In *Historical Relatedness and Style in Oceania: Expanding Archaeological Method and Theory through New Applications*, ed. M. W. Graves and E. E. Cochrane. Ms on file with the author.

GRAVES, M. W., AND T. N. LADEFOGED
1995 The evolutionary significance of ceremonial architecture in Polynesia, in *Evolutionary Archaeology: Methodological Issues*: 149–174, ed. P. A. Teltser. Tucson: The University of Arizona Press.

GRAVES, M. W., AND M. SWEENEY
1993 Ritual behaviour and ceremonial structures in eastern Polynesia: Changing perspectives on archaeological variability, in *The Evolution and Organisation of Prehistoric Society in Polynesia*: 106–125, ed. M. W. Graves and R. C. Green. Monograph 19. Auckland: New Zealand Archaeological Association.

GREEN, R. C.
1973 Tonga's prehistoric population. *Pacific Viewpoint* 14 : 61–74.
1974 Sites with Lapita pottery: Importing and voyaging. *Mankind* 9 : 253–259.
1993 Community-level organisation, power and elites in Polynesian settlement pattern studies, in *The Evolution and Organisation of Prehistoric Society in Polynesia*: 9–12, ed. M. W. Graves and R. C. Green. Monograph 19. Auckland: New Zealand Archaeological Association.

GROUBE, L. M.
1971 Tonga, Lapita pottery, and Polynesian origins. *Journal of the Polynesian Society* 80 : 278–316.

GUIART, J.
1963 Un etat palatial oceanien: L'empire maritime des Tui Tonga, appendix to *Structure de la chefferie en Melanesie du Sud.* Paris: Travaux et Memoires de l'Institut d'Ethnologie LXVI.

GUNSON, N.
1990 The Tonga-Samoa connection 1777–1845: Some observations on the nature of Tongan imperialism. *Journal of Pacific History* 25 : 176–187.

HADDON, A. C., AND J. HORNELL
1936 *Canoes of Oceania: Volume 1: The Canoes of Polynesia, Fiji, and Micronesia.* B. P. Bishop Museum Special Publication 27. Honolulu: Bishop Museum.

HAGE, PER, AND FRANK HARARY
1996 *Island Networks: Communication, Kinship, and Classification Structures in Oceania.* Cambridge: Cambridge University Press.

HARRIS, M.
1979 *Cultural Materialism: The Struggle for a Science of Culture.* New York: Random House.

HAWKES, K.
1992 Sharing and collective action, in *Ecology, Evolution, and Human Behavior*: 269–300, ed. E. A. Smith and B. Winterhalder. New York: Aldine de Gruyter.

HENRY, B. F.
1980 *Samoa: A Early History*. Pagopago: Department of Education, American Samoa.

HERDA, P. S.
1988 *The Transformation of the Traditional Tongan Polity: A Genealogical Consideration of Tonga's Past*. Ph.D. diss. Australian National University, Canberra.
1990 The politics of Tongan tradition. Unpublished manuscript.

HOCART, A. M.
1929 *Lau Islands, Fiji*. B. P. Bishop Museum Bulletin 62.
1952 *The Northern States of Fiji*. Occasional Publications 11. Royal Anthropological Institute.

HOMMON, R. J.
1976 *The Formation of Primitive States in Pre-Contact Hawaii*. Ph.D. diss. University of Arizona.

HOWARD, A.
1991 Seamanship on Rotuma. Unpublished document. University of Hawai'i, Honolulu.

HUNT, T. L.
1987 Patterns of human interaction and evolutionary divergence in the Fiji Islands. *Journal of the Polynesian Society* 96 : 299–334.
1989 *Lapita Ceramic Exchange in the Mussau Islands, Papua New Guinea*. Ph.D. diss. University of Washington, Seattle.

IRWIN, G.
1992 *The Prehistoric Exploration and Colonisation of the Pacific*. Cambridge: Cambridge University Press.

KAEPPLER, A. L.
1971 Rank in Tonga. *Ethnology* 10 : 174–193.
1973*a* A comparative note on Anutan social organization, in *Anuta: A Polynesian Outlier in the Solomon Islands*, ed. D. E. Yen and J. B. P. Gordon. Special Papers Bernice P. Bishop Museum 21.
1973*b* Pottery sherds from Tungua, Ha'apai, and remarks on pottery and social structure in Tonga. *Journal of the Polynesian Society* 82 : 218–222.
1978 Exchange patterns in goods and spouses: Fiji, Tonga, and Samoa. *Mankind* 11 : 246–252.

KIRCH, P. V.
1976 Ethno-archaeological investigations in Futuna and 'Uvea (Western Polynesia): A preliminary report. *Journal of the Polynesian Society* 85 : 27–69.
1977 Ethnoarchaeological investigation on Niuatoputapu, Tonga: A Preliminary Report to the National Science Foundation. Department of Anthropology Report Series. Honolulu: Bishop Museum.
1980 Burial structures and societal ranking in Vava'u, Tonga. *Journal of the Polynesian Society* 89 : 291–308.
1984 *The Evolution of Polynesian Chiefdoms*. Cambridge: Cambridge University Press.
1988*a* Circumscription theory and sociopolitical evolution in Polynesia. *American Behavioral Scientist* 31 : 416–427.
1988*b* *Niuatoputapu: The Prehistory of a Polynesian Chiefdom*. Monograph 5. Seattle: Thomas Burke Memorial Washington Museum, University of Washington.
1990*a* The evolution of sociopolitical complexity in prehistoric Hawaii: An assessment of the archaeological evidence. *Journal of World Prehistory* 4 : 311–345.
1990*b* Monumental architecture and power in Polynesian chiefdoms: A comparison of Tonga and Hawaii. *World Archaeology* 22 : 206–222.
1997 Historical ecology in Pacific Islands: Prehistoric and landscape change, in *The Environmental History of Oceanic Islands*: 1–21, ed. P. V. Kirch and T. L. Hunt. New Haven: Yale University Press.

KIRCH, P. V., AND R. GREEN
1987 History, phylogeny, and evolution in Polynesia. *Current Anthropology* 28 : 431–456.

KIRCH, P. V., AND D. E. YEN
1982 *Tikopia: The Prehistory and Ecology of a Polynesian Outlier*. B. P. Bishop Museum Bulletin 238. Honolulu.

KOLB, M. J.
1991 Social Power, Chiefly Authority, and Ceremonial Architecture in an Island Polity, Maui, Hawaii. Ph.D. diss. Department of Anthropology, University of California, Los Angeles.
1994 Monumentality and the rise of religious authority in pre-Contact Hawaii. *Current Anthropology* 35(5) : 521–548.

LADEFOGED, T. N.
1993*a* Evolutionary Process in an Oceanic Chiefdom: Intergroup Aggression and Political Integration in Traditional Rotuman Society. Ph.D. diss. University of Hawai'i, Honolulu.
1993*b* The impact of resource diversity on the sociopolitical structure of Rotuma: A geographic information system analysis, in *The Evolution and Organisation of Prehistoric Society in Polynesia*: 64–71. Monograph 19. Auckland: New Zealand Archaeological Association.
1995 The evolutionary ecology of Rotuman political integration. *Journal of Anthropological Archaeology* 14 : 341–358.

LADEFOGED, T. N., M. W. GRAVES, AND R. P. JENNINGS
1996 Dryland agricultural expansion and intensification in Kohala, Hawai'i Island. *Antiquity* 70 (270) : 861–880.

LANGDON, R.
1977 The maritime explorers, in *Friendly Islands: A History of Tonga*: 41–61, ed. N. Rutherford. Melbourne: Oxford University Press.

LEACH, HELEN M.
1993 The role of major quarries in Polynesian prehistory, in *The Evolution and Organisation Society in Polynesia*: 33–42, ed. M. W. Graves and R. C. Green. Monograph 19. Auckland: New Zealand Archaeological Association.

LESSIN, A. P., AND P. J. LESSIN
1970 A Village of Conquerors, Sawana: A TonganVillage in Fiji. Department of Anthropology, University of Oregon.

LEWIS, D.
1972 *We the Navigators*. Honolulu: University of Hawai'i Press.

LOEB, E. M.
1926 *History and Traditions of Niue*. B. P. Bishop Museum Bulletin 32.

MACGREGOR, G.
1937 *Ethnology of the Tokelau Islands*. B. P. Bishop Museum Bulletin 146.

MAHINA, O.
1986 Religion, Politics, and the Tu'i Tonga Empire. M.A. thesis. Department of Anthropology, University of Auckland.

MARCUS, G. E.
1988 Chieftanship, in *Developments in Polynesian Ethnology*: 175–210, ed. A. Howard and R. Borofsky. Honolulu: University of Hawai'i Press.

MARTIN, J.
1818 *An Account of the Natives of Tonga Islands . . . Arranged from the Extensive Communications of Mr. William Mariner*. 2 vols. London: John Murray.

MAUDE, ALARIC
1970 Shifting cultivation and population growth in Tonga. *Journal of Tropical Geography* 31 : 57–64.

MCKERN, W. C.
1929 *Archaeology of Tonga*. B. P. Bishop Museum Bulletin 60.

MONIZ-NAKAMURA, J. J.
1998 Using Evolutionary Ecology to Understand Human Impact on Birds. Paper developed for the Forum on Evolutionary Theory in Oceania: Applications to the Archaeological, Linguistic, and Ethnohistorical Records, Sixty-Third Annual Meeting of the Society for American Archaeology, Seattle, Washington.

NEIMAN, FRASER
1997 Conspicuous consumption as wasteful advertising: A Darwinian perspective on spatial patterns in Classic Maya terminal monument dates, in *Rediscovering Darwin: Evolutionary Theory and Archeological Explanation*: 267–290, ed. C. M. Barton and G. A. Clark. Archeological Papers No. 7. Washington, D.C.: American Anthropological Association.

PAWLEY, A.
1966 Polynesian languages: A sub-grouping based on shared innovations in morphology. *Journal of the Polynesian Society* 75 : 39–64.

POLLOCK, N. J.
1996 Rethinking Western Polynesia: 'Uvea in the Early Tongan Empire, in *Oceanic Culture History: Essays in Honour of Roger Green*: 433–444, ed. J. Davidson et al. Special Publication. Dunedin: New Zealand Journal of Archaeology.

ROGERS, GARTH
1974 Archaeological discoveries on Niuatoputapu Island, Tonga. *Journal of the Polynesian Society* 83 : 308–348.

SAHLINS, M.
1958 *Social Stratification in Polynesia*. Seattle: University of Washington Press.
1963 Poor man, rich man, big-man, chief: Political types in Melanesia and Polynesia. *Comparative Studies in Society and History* 5 : 285–303.

SAND, C.
1993 A preliminary study of the impact of the Tongan maritime chiefdom on late prehistoric society of 'Uvea, Western Polynesia, in *The Evolution and Organisation of Prehistoric Society in Polynesia*: 43–51, eds. M. W. Graves and R. C. Green. Monograph 19. Auckland: New Zealand Archaeological Association.

SMITH, E. A.
1987 Optimization theory in anthropology: Applications and critiques, in *The Latest on the Best: Essays on Evolution and Optimality*: 201–249, ed. J. Dupre. Cambridge: The Massachusetts Institute of Technology Press.

SMITH, E. A., AND B. WINTERHALDER
1992 Natural selection and decision-making: Some fundamental principles, in *Ecology, Evolution, and Human Behavior*: 25–60, ed. E. A. Smith and B. Winterhalder. New York: Aldine de Gruyter.

STERNDALE, H. B.
1874 Memoranda on some of the south sea islands. Parliamentary Papers, New Zealand.

SUGGS, R. C.
1961 *The Archaeology of Nuku Hiva, Marquesas Islands, French Polynesia*. Anthropological Papers, Vol. 49, Part 1. New York: American Museum of Natural History.

THOMAS, W. L.
1963 The variety of physical environments among Pacific islands, in *Man's Place in the Island Ecosystem*, ed. F. R. Fosberg. Honolulu: Bishop Museum Press.

THOMPSON, L.
1940 *Southern Lau: An Ethnography*. B. P. Bishop Museum Bulletin 162.

TIPPETT, A.
1968 *Fijian Material Culture*. B. P. Bishop Museum Bulletin 232.

TUGGLE, H. D.
1979 Hawaii, in *The Prehistory of Polynesia*: 167–199, ed. J. D. Jennings. Cambridge: Harvard University Press.

URBANOWICZ, C.
1973 Tongan Culture: The Methodology of an Ethnographic Reconstruction. Ph.D. diss. University of Oregon.

VASON, G.
1810 *Authentic Narrative of Four Years' Residence in Tongataboo*. London: Longmans.

WEST, T.
1865 *Ten Years in South-Central Polynesia*. London: James Nisbet & Company.

WILLIAMSON, R. W.
1924 *The Social and Political Systems of Central Polynesia*. Cambridge: Cambridge University Press.

WINTERHALDER, B.
1990 Open field, common pot: Harvest variability and risk avoidance in agricultural and foraging societies, in *Risk and Uncertainty in Tribal and Peasant Economies*: 67–87, ed. E. Cashdan. Boulder: Westview Press.

WOODFORD, C. M.
1906 Some accounts of Sikaiana or Steward's Island in the British Solomon Islands Protectorate. *Man* 6 : 164–169.

ABSTRACT

The evolution of the Tongan maritime empire, involving both the development of social complexity and geographic expansion through conquest and trading, are examined by means of evolutionary ecology. This Darwinian evolutionary framework provides the mechanism and identifies the environmental structure, processes, and behavioral strategies by which to account for the geographic and temporal pattern of change in Tonga and related islands. Both ethnohistorical and archaeological data are employed in this analysis, showing how both may reveal overlapping aspects of historical change. The results of this research highlight the importance not only of competition but also of cooperative strategies in the evolution of social complexity and the process of geographic expansion. Key to explaining the evolution of Tongan social complexity are the productive but uncertain environment of Tongatapu, the location of Tongatapu in relation to other islands and prevailing winds, the small landmass of the island, the relatively early integration of the island into a single polity, the creation of collateral ruling lineages, the appropriation of voyaging technology to redirect competition from within Tongatapu to other islands through colonization, aggression, staple and wealth goods trade, and the exchange of spouses. KEYWORDS: evolution of social complexity, evolutionary ecology, Tongan maritime complex, Polynesian archaeology, ethnohistory.